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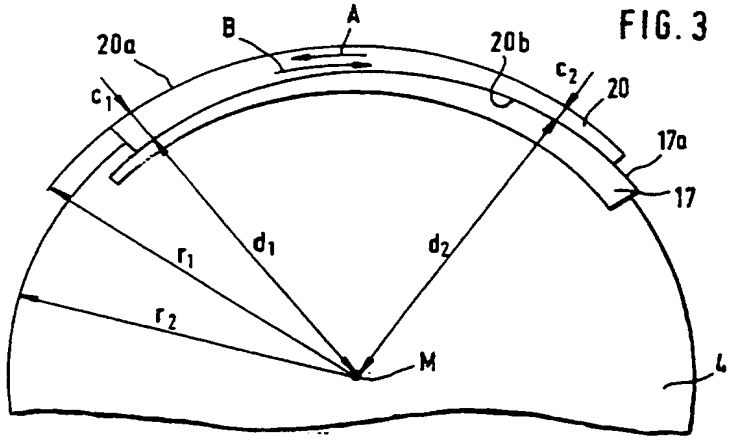
(54) **Carding:adjusting gap between clothing on cylinder and top bars**

(57) In a carding machine, travelling, clothed card top bars slide at each end on curved, wedge-shaped slideways 20 each arranged on a respective wedge-shaped member 17. During machine operation, relative longitudinal sliding displacement of slideways 20 and members 17 changes the distance between the tips of the clothing on the bars and on the cylinder. An automatic system for changing the distance, including measurement of fibre length, nep count and the distance, is described. Members 17 are flexible.

FIG. 3



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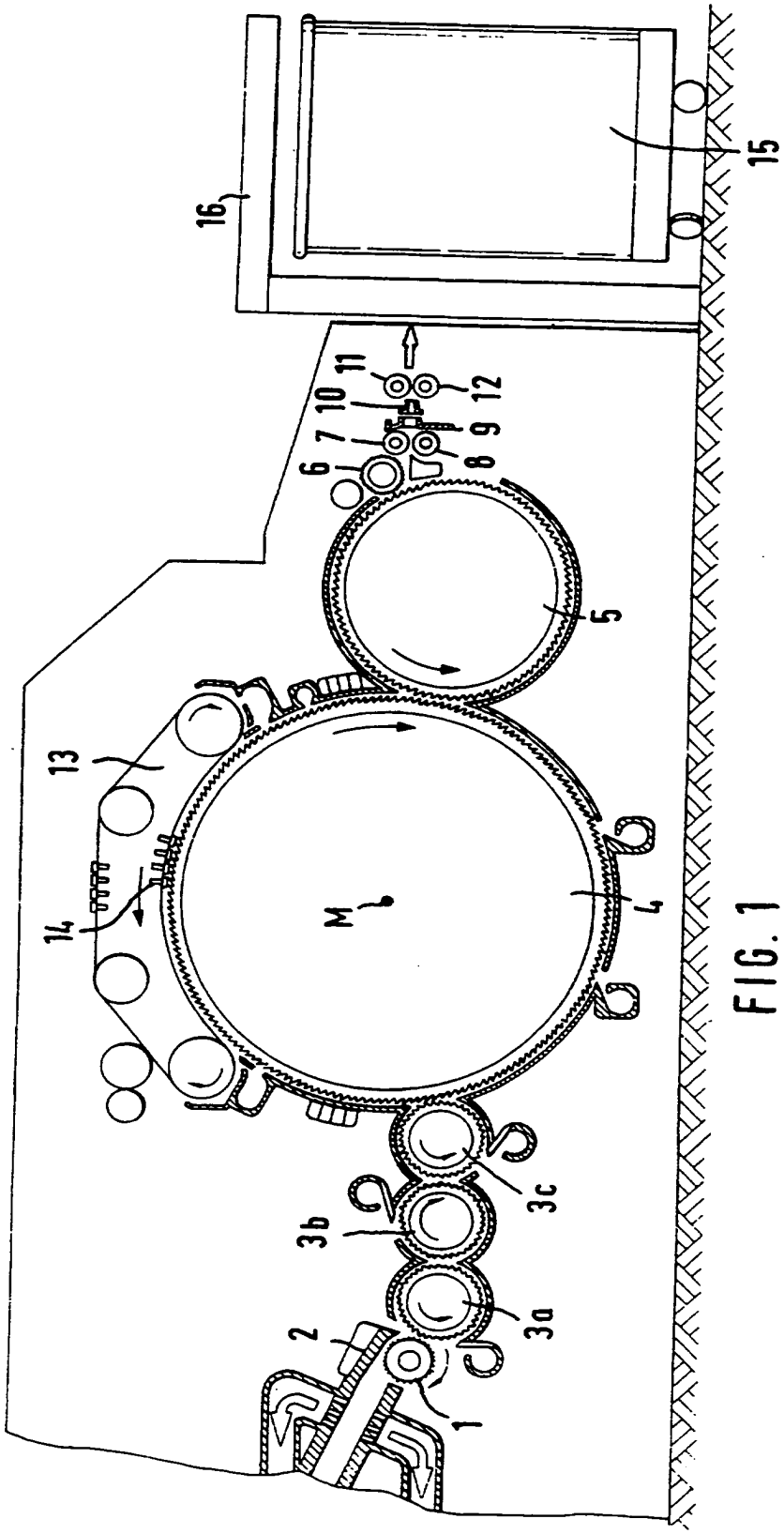


FIG. 1

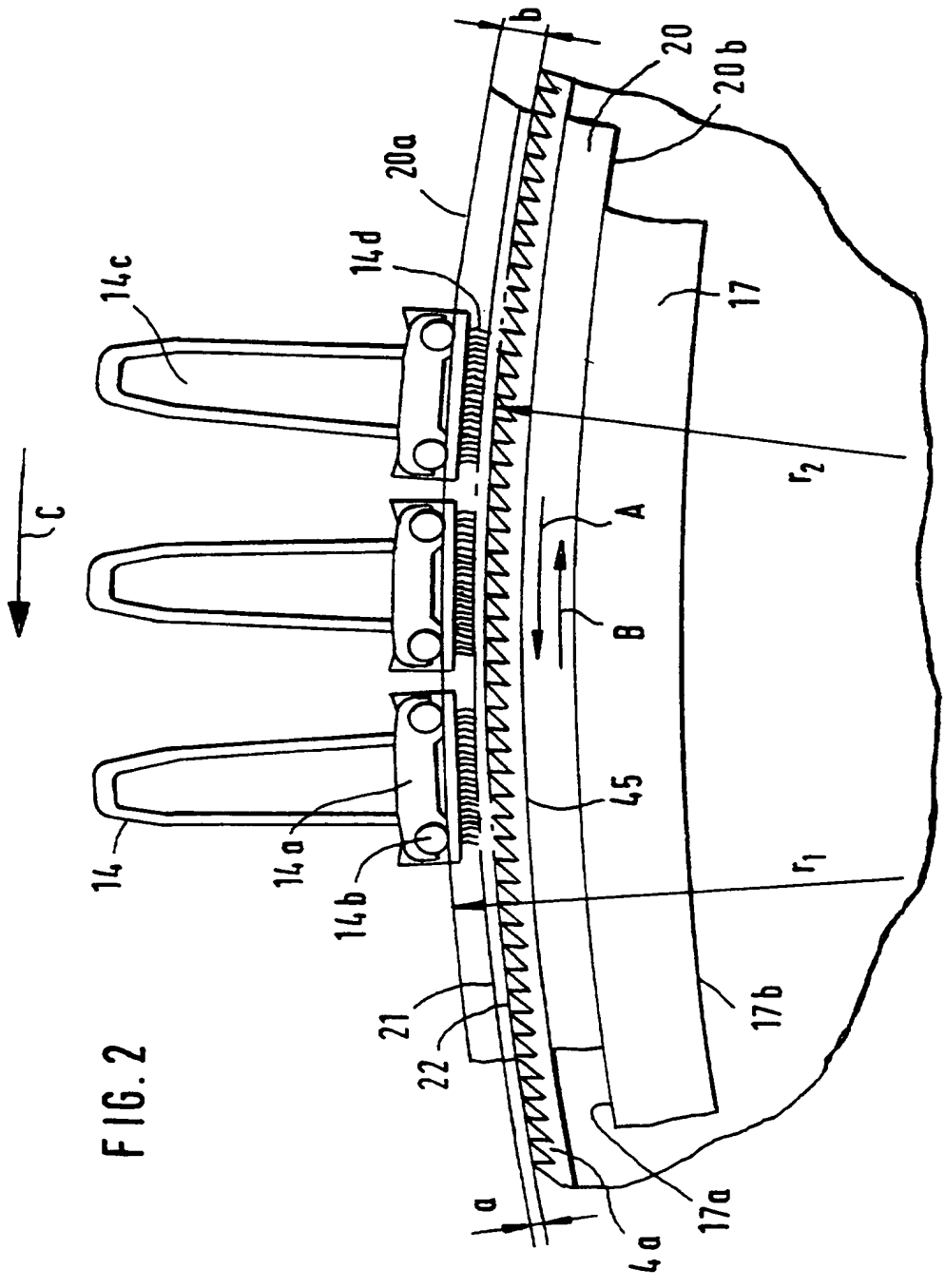


FIG. 2

FIG. 3

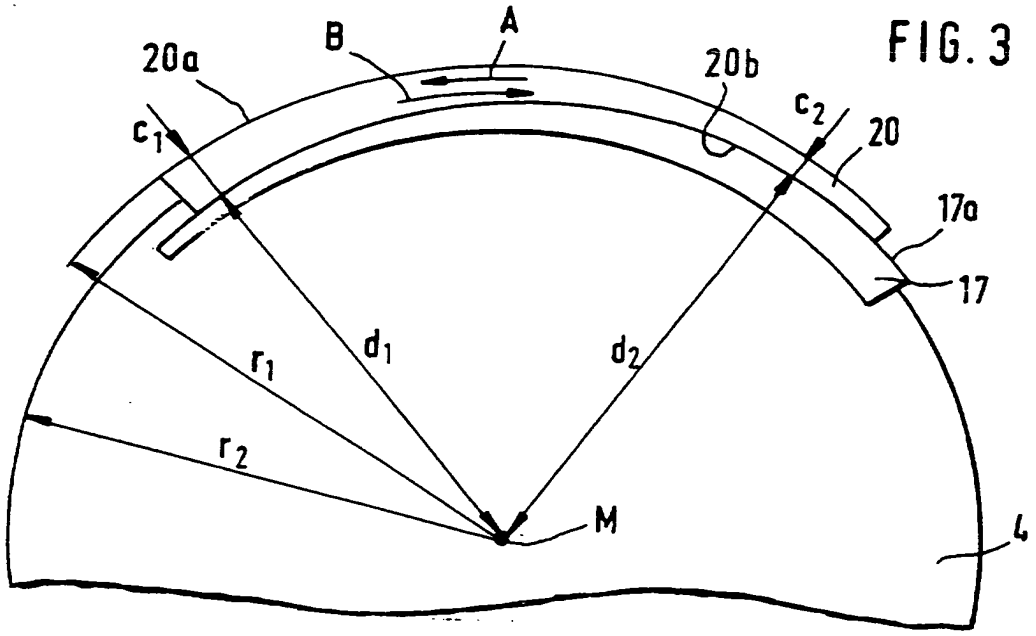

B
A
20a
20b
c1
c2
20
17a
17
r1
d1
d2
r2
M
4

FIG. 4

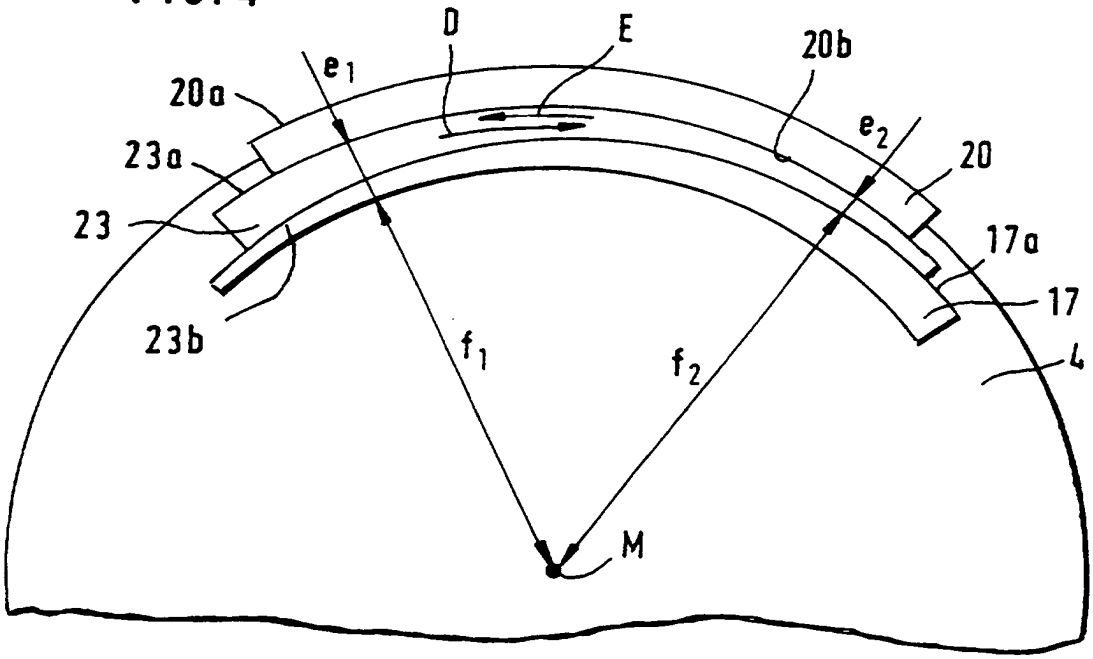

D
E
e1
20b
20a
e2
23a
20
23
17a
17
23b
f1
f2
4
M

FIG. 5

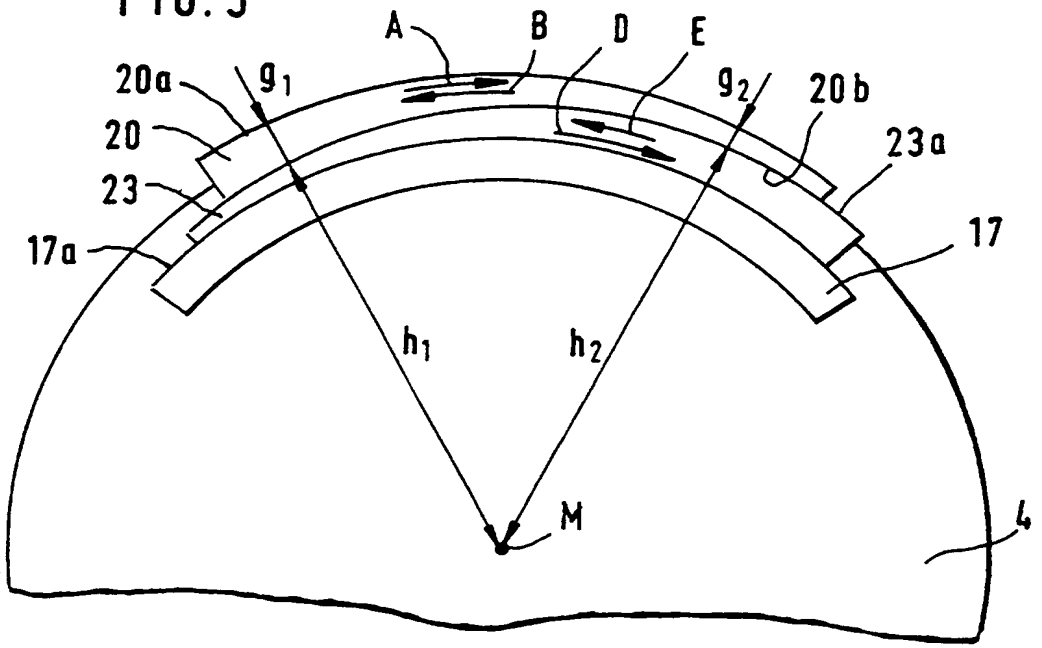
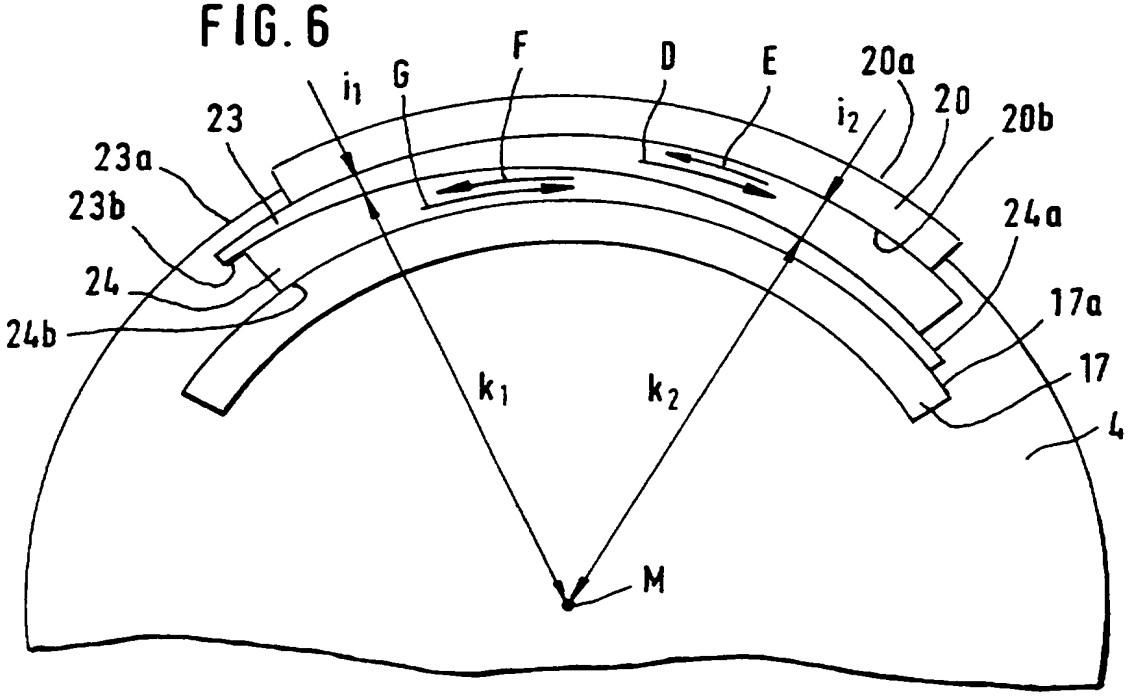

A
B
D
E
20a
g_1
g_2
20b
20
23a
23
17a
17
h_1
h_2
M
4

FIG. 6


i_1
G
F
D
E
20a
i_2
20
20b
23
23a
23b
24a
24
24b
17a
17
k_1
k_2
M
4

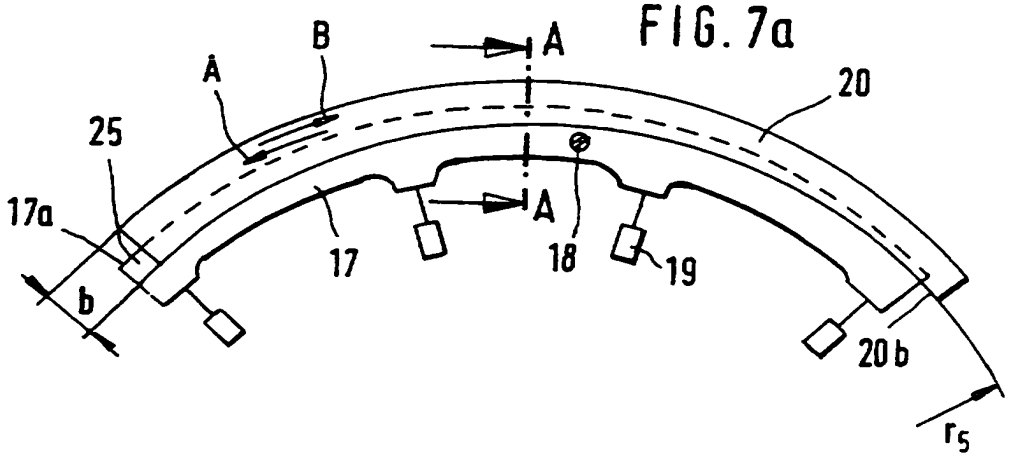


FIG. 7a

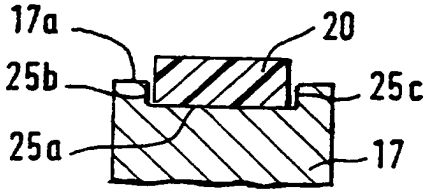


FIG. 7b

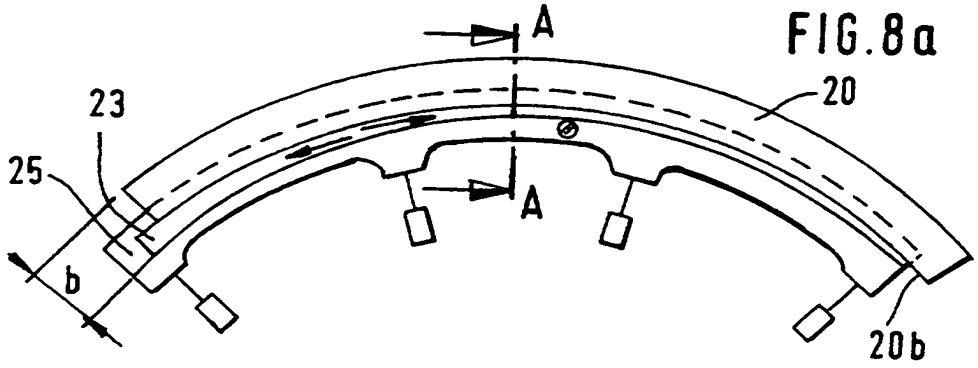


FIG. 8a

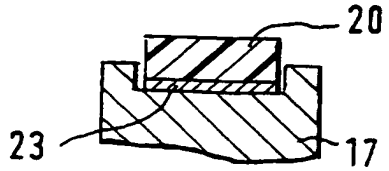


FIG. 8b

FIG. 9a

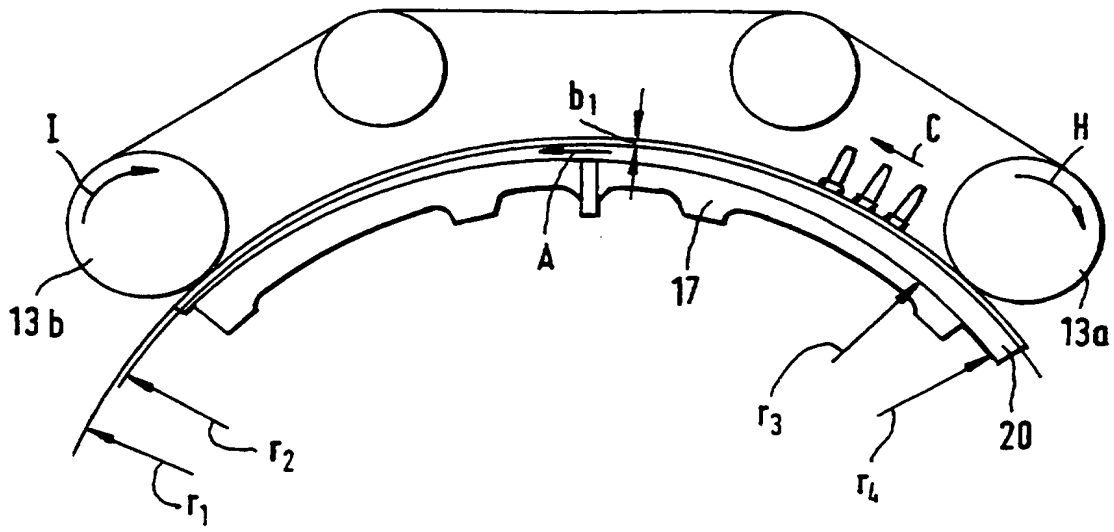
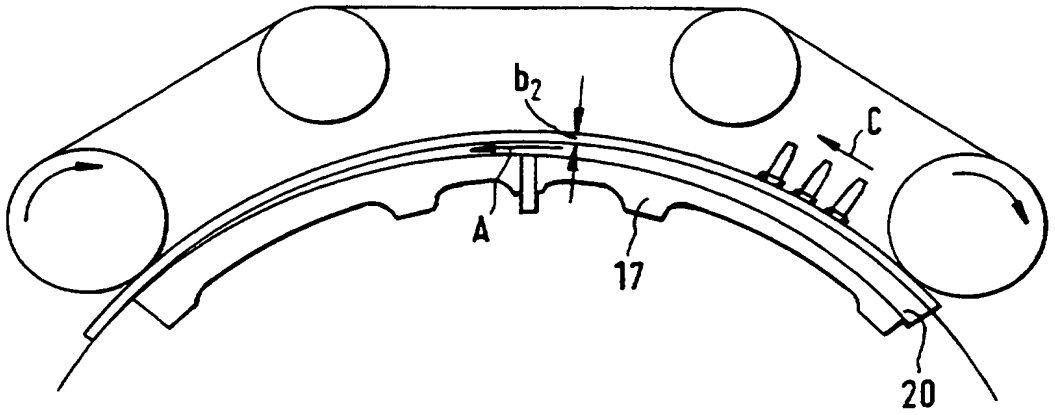


FIG. 9b



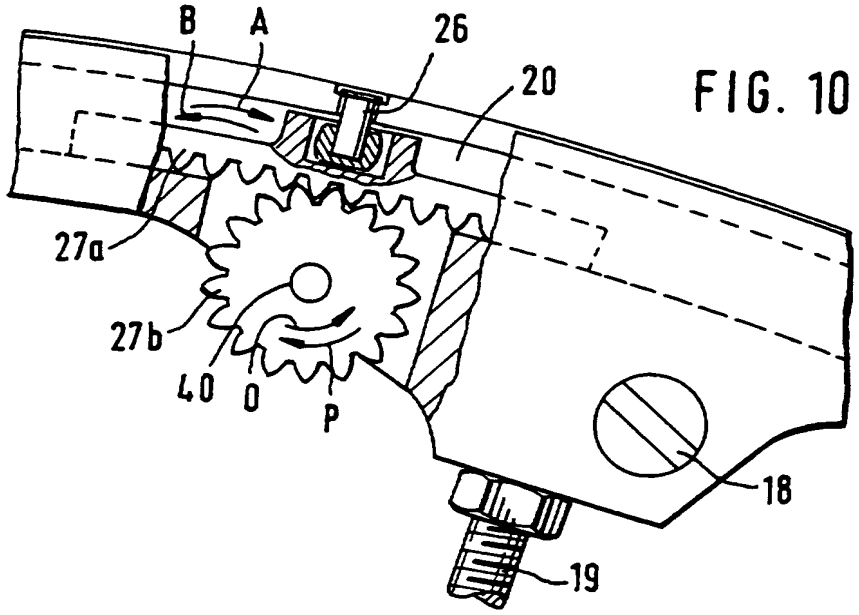


FIG. 10

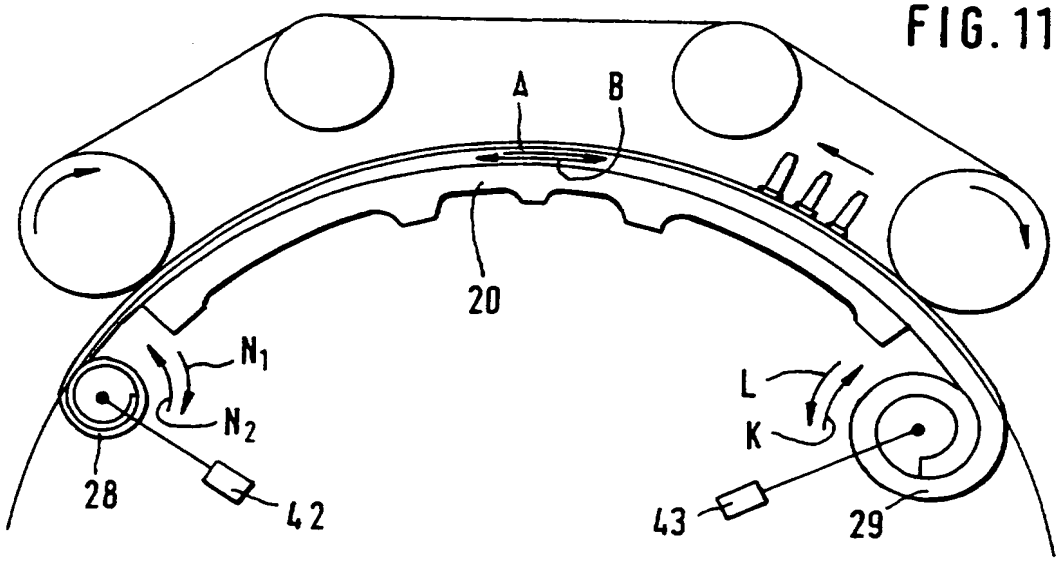


FIG. 11

FIG.12

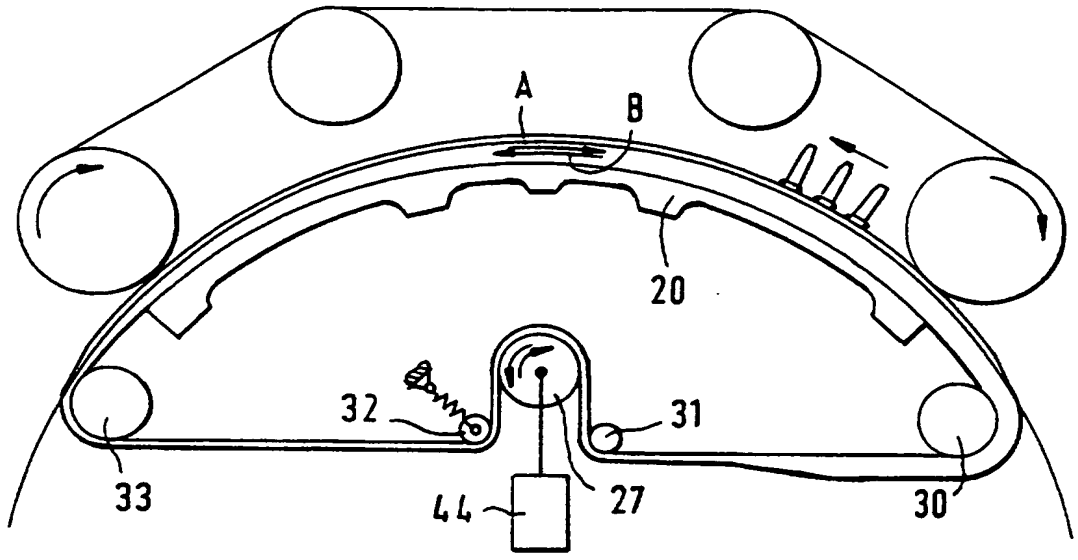
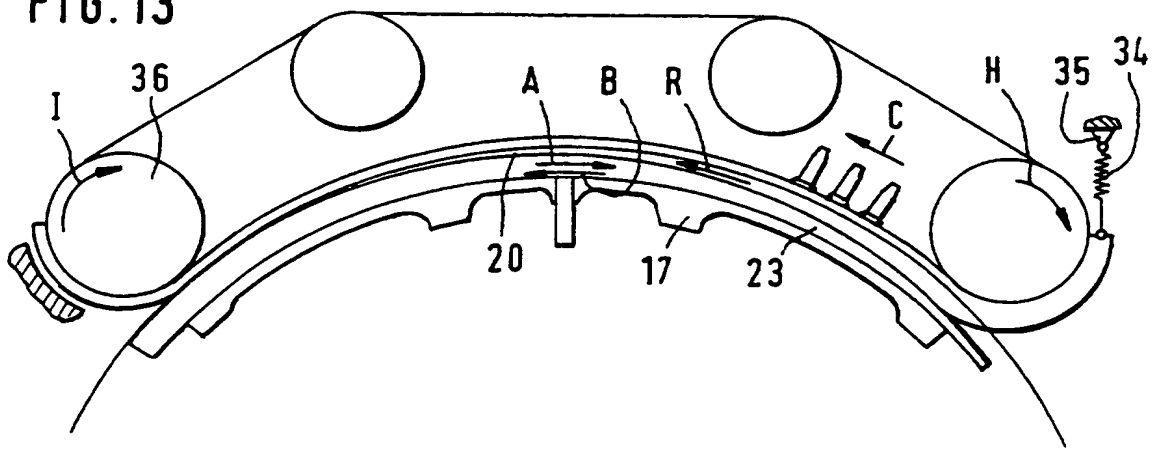


FIG.13



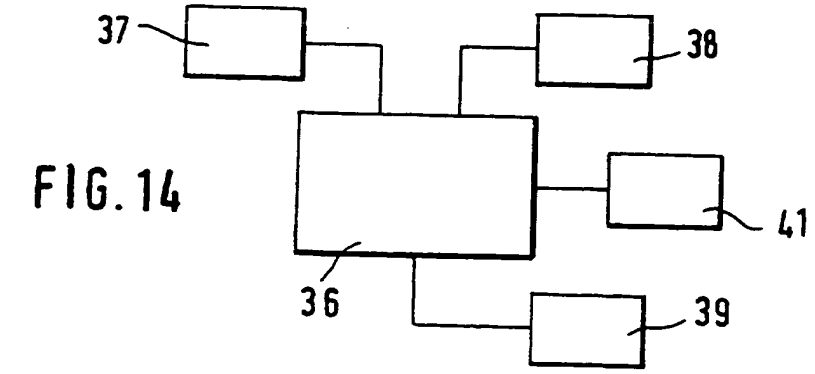


FIG. 14

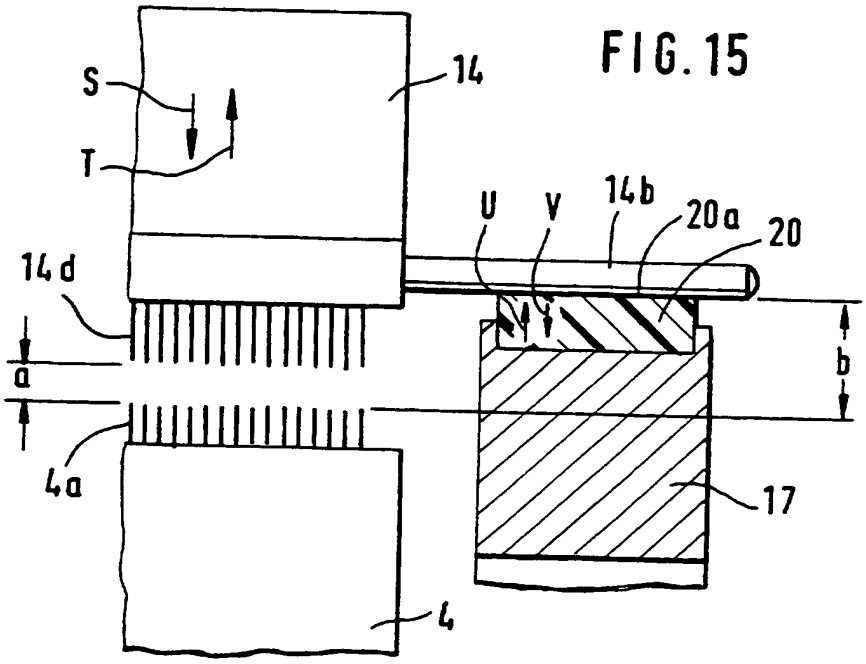


FIG. 15

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Apparatus comprising clothed card top bars on a carding machine for textile fibres

The invention relates to an apparatus on a carding machine for textile fibres, for example, cotton, man-made fibres or similar fibres, having a revolving card top comprising clothed card top bars.

In a known apparatus, a gap is present between the tips of the card top clothings and the tips of the cylinder clothing and the card top bars slide with both ends on convexly curved slideways, each of which is formed by a flexible element that is arranged on a convex surface of the associated flexible bends. In the known apparatus, the distance between, on the one hand, the convex outer surface of the slideway and, on the other hand, the concave inner surface of the slideway and the convex outer surface of the flexible bend, is the same in the circumferential direction. The convex outer surface of the slideway, the concave inner surface of the slideway and the convex outer surface of the flexible bend are arranged concentrically with one another in relation to the cylinder axis of the carding machine. The flexible bend has a recess, for example, a channel, in which the slideway for the card top bars is fixedly mounted. In order to change the distance between the tips of the card top clothings and the tips of the cylinder clothing, for example, because of an increasing nep count and/or reduction in fibre length in the card sliver, the position of the flexible bend is changed by several adjusting screws, whereupon at the same time the position of the slideway is changed so that,

by way of the heads of the card top, the position of the card top bars with the card top clothing and the distance between the clothings is similarly changed. Such re-setting of the flexible bend is complicated. In addition, the geometry of the flexible bend is dependent on the number of adjusting screws. For that purpose, lateral elements of the card, for example, driving means, suction means and also the card top bars, have to be removed and re-mounted when the machine is at a standstill. The assembly work that this involves is considerable. In addition, continuous production operation of the carding machine is interrupted by the stoppage.

It is an aim of the invention to provide an apparatus which avoids or mitigates the said disadvantages and which in particular enables the intensity of carding to be changed in a simple manner, preferably during continuous operation.

The present invention provides an apparatus comprising clothed card top bars on a carding machine for textiles, for example, cotton, man-made fibres or similar fibres, in which a gap is present between the tips of the card top clothings and the tips of the cylinder clothing and in which the card top bars slide with each of their ends on a respective convexly curved slideway, each of which is formed by a flexible element that is arranged on a convex surface of a respective flexible bend, wherein the slideway is arranged to be displaced in a radial direction such that the distance between the tips of the card top clothings and the tips of the cylinder clothing remains uniform at all points over the circumference.

The features according to the invention enable the intensity of carding to be changed in a simple manner in response to changes in technological variables, for example, the nep count and/or fibre damage. A further particular advantage consists in that the distance between the card top clothings and the cylinder clothing, which is advantageously substantially the same at all points over the circumference, is substantially maintained once the slideway has been displaced, whereby a considerable improvement in the resulting fibre sliver is achieved. The position of the convex outer surface of the slideway is displaced in the radial direction. The flexibility (resilience) of the slideway ensures that the form of the bend can be adapted to the outer surface of the slideway, so that the uniformity of the distance between the card top clothing and the cylinder clothing at all points over the circumference is ensured. A further advantage consists in that the displacement can be effected continuously, for example, during operation. That can be done automatically or without delay "at the push of a button", with the result that any time-consuming assembly work and any interruption to production can be avoided. It is furthermore especially advantageous that the convex outer surface of the slideway - on which the heads of the card top bars lie - is displaced in the radial direction on both sides of the machine concentrically with respect to the cylinder circumference (cylinder envelope). In this way, an infinite number of support points for the heads of the card top bars can be progressively set.

In one advantageous form of the invention, provision is made for the distance between the convex outer surface of the slideway and the concave inner surface of the slideway in the circumferential direction to decrease or increase and for the distance between the convex bearing surface of the flexible bend and the axis of the cylinder to increase or decrease correspondingly, so that the sum of the two distances is substantially constant at all points over the circumference. According to a further advantageous construction, in which the distance between the curved convex outer surface of the slideway and the concave inner surface of the slideway is constant, an intermediate layer is present between the slideway and the bearing surface of the flexible bend and the distance between the convex outer surface of the intermediate layer and the concave inner surface of the intermediate layer in the circumferential direction decreases or increases, and the distance between the convex bearing surface of the flexible bend and the axis of the cylinder increases or decreases correspondingly, so that the sum of the two distances is substantially constant at all points over the circumference. In yet another advantageous form of the invention, between the slideway and the bearing surface of the flexible bend there is preferably provided an intermediate layer, and the distance between the convex outer surface of the slideway and the concave inner surface of the slideway in the circumferential direction decreases or increases, and the distance between the convex outer surface of the intermediate element and the axis of the cylinder increases or decreases correspondingly,

so that the sum of the two distances is substantially constant at all points over the circumference. In a further preferred construction, in which the distance between the curved convex outer surface of the slideway and the concave inner surface of the slideway is constant, between the slideway and the bearing surface of the flexible bend there are two intermediate layers, and the distance between the convex outer surface and the concave inner surface of the first intermediate layer in the circumferential direction decreases or increases and the distance between the convex outer surface of the second intermediate layer and the axis of the cylinder increases or decreases correspondingly, so that the sum of the two distances is substantially constant at all points over the circumference. Advantageously, the slideway and/or the flexible bend are/is displaceable circumferentially, that is, are slideable, whereby the convex outer surface of the slideway is displaceable locally concentrically in the radial direction. The displacement of the slideway circumferentially on a bend provides a cross-section for the slideway that is resistant to bending. The slideway is advantageously made of low-friction material for the card top bars to slide on, which at the same time advantageously promotes sliding of the slideway on the associated opposing bearing surface.

The intermediate layer is and/or the flexible bends are preferably circumferentially displaceable, for example, slideable, whereby the convex outer surface of the slideway is displaceable locally concentrically in the radial direction. Advantageously the slideway and/or the intermediate

layer are/is circumferentially displaceable, for example slideable, whereby the convex outer surface of the slideway is displaceable locally concentrically in the radial direction. Where there are two intermediate layers, those are preferably circumferentially displaceable, for example slideable, whereby the convex outer surface of the slideway is displaceable locally concentrically in the radial direction. During displacement, for example, during sliding, two elements of wedge-like construction advantageously slide on one another. The slideway is preferably in the form of a curved wedge. The intermediate layer is or the intermediate layers are advantageously in the form of a curved wedge. The intermediate layer is or the intermediate layers are preferably formed by a flexible element. The intermediate layer is or the intermediate layers are advantageously in the form of a metal band, for example, a steel band. The distance between the convex outer surface of the slideway and the concave inner surface of the slideway preferably decreases or increases uniformly. The convex outer surface of the slideway is advantageously displaceable concentrically with respect to the envelope of the cylinder. The convex outer surface of the slideway is preferably circularly curved. The concave inner surface of the slideway advantageously lies on the envelope of the flexible bend. In an apparatus in which the flexible bend has a recess, for example, a channel, for the slideway, the concave inner surface of the slideway preferably lies on the convex base of the channel. The concave inner surface of the slideway advantageously lies on the convex outer surface of the intermediate layer. The concave inner

surface of the intermediate layer preferably lies on the convex base of the channel. The concave inner surface of the first intermediate layer advantageously lies on the convex outer surface of the second intermediate layer. The intermediate layer or intermediate layers is/are preferably arranged in the channel. The slideway advantageously projects beyond the convex outer surface of the flexible bend. The displacement device preferably engages substantially at the middle of the slideway. The slideway and/or the intermediate layer or intermediate layers is/are advantageously formed by a plastics material element. The plastics material element preferably has a low coefficient of friction. The plastics material is preferably reinforced, for example, by glass fibres, carbon fibres or similar such fibres. The slideway and/or the intermediate layer or layers preferably consists/consist of a flexible metal band, for example, of steel. The slideway is advantageously guided laterally in the channel (by lateral faces of the channel). The slideway is preferably vertically displaceable in the channel. The slideway is advantageously circumferentially displaceable in the channel. The form of the intermediate layer is preferably produced by machining, for example, grinding or a similar process. The form of the convex bearing surface of the flexible bend and/or the base of the channel is preferably produced by machining, for example, grinding or a similar process. A displacement device for local displacement of the slideway and/or the intermediate layer or intermediate layers and/or the flexible bend is preferably provided. A driving device, for example, a motor, is

advantageously associated with the displacement device. The displacement device preferably has actuators, for example, a lever, toothed rack, gearwheel, rotary joints or similar means. The displacement device advantageously engages substantially the middle of the slideway and/or the intermediate layer or intermediate layers. A transmission element is preferably provided between the slideway and/or the intermediate layer or intermediate layers and the driving device. The ends of the slideway and/or the intermediate layer or intermediate layers are advantageously secured to driven rotatable winding cylinders or similar means. The slideway and/or the intermediate layer or intermediate layers is/are in the form of an endless belt, which runs around at least two guide rollers. At least one guide roller is advantageously driven, for example, by a motor. Outside the flexible bend, at least a part of the slideway and/or the intermediate layer or intermediate layers preferably has teeth which co-operate with at least one gearwheel. The slideway advantageously co-operates with at least one band-shaped element, which is substantially in the form of a curved wedge. The slideway and the band-shaped element are preferably circumferentially displaceable. The drive device, for example, a motor, is advantageously connected to an electronic automatic control system, for example, a microcomputer, for displacement of the slideway and/or the intermediate layer and/or the flexible bend. A measuring element for measuring the fibre length is preferably connected to the automatic electronic control system. A measuring element for detecting the

nep count is advantageously connected to the automatic electronic control system. A measuring element for measuring the distance between the tips of the card top clothings and the tips of the cylinder clothing is preferably connected to the automatic electronic control system. A switching element for operating the driving device for the displacement, for example, sliding, is advantageously connected to the electronic automatic control system.

The present invention also provides an apparatus on a carding machine comprising a plurality of card top bars and a support structure having a surface upon which ends of the card top bars can rest with their carding surfaces opposed to a part of the surface of the carding cylinder, wherein the support structure comprises first and second co-operating members, of which the first member is so configured that it tapers in a first direction circumferentially relative to the cylinder and the second member is so configured that it tapers in the opposite circumferential direction, the first and second members having co-operating curved surfaces along which relative slideable displacement of the first and second members relative to one another circumferentially with respect to the cylinder can be effected, the arrangement being such that relative slideable displacement between said first and second members effects radial displacement of the card top bar support surface.

The invention also provides a method of adjusting the spacing between card top bars of a carding machine and the surface of a portion of a carding cylinder facing the card top bars, comprising slideably displacing relative to one another a pair of wedge

members, said sliding displacement occurring along co-operating curved surfaces of the wedge members and in a direction which is substantially circumferential relative to the cylinder, whereby a support surface for the card top bars is caused to move radially inwards or outwards relative to the cylinder.

Certain illustrative embodiments of the invention will now be described in detail, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic side view of a carding machine for use with the apparatus according to the invention;

Fig. 2 is a schematic side view of a part of a previously known carding machine showing card top bars, a portion of a slideway and a flexible bend, and indicating the distance between the clothing of the card top bars and cylinder clothing;

Fig. 3 is a schematic side view of a carding cylinder having a flexible bend and slideway according to one embodiment of the invention;

Fig. 4 is a schematic side view of a carding cylinder with a flexible bend with slideway and sliding intermediate layer according to another embodiment of the invention;

Fig. 5 is a schematic side view of a carding cylinder with a flexible bend with sliding slideway and sliding intermediate layer according to a third embodiment;

Fig. 6 is a schematic side view of a carding cylinder having a flexible bend with two

sliding intermediate layers according to a fourth embodiment;

Fig. 7a is a side view, partly in section, of a flexible bend with channel and partially mounted slideway;

Fig. 7b is a section through the arrangement shown in Fig. 7a;

Fig. 8a is a side view, partly in section, of an arrangement with an intermediate layer and the slideway partially mounted in the channel of a flexible bend;

Fig. 8b is a section through the arrangement shown in Fig. 8a;

Fig. 9a is a side view of a flexible bend and a revolving card top with a slideway in a first position;

Fig. 9b is a side view of the arrangement of Fig. 9a with the slideway in a second position;

Fig. 10 is a side view, partly in section, of one form of displacement element for the slideway;

Fig. 11 is a side view of a part of a carding cylinder showing a slideway with two winding rollers, one at each end;

Fig. 12 is a side view of a part of a carding cylinder with a slideway in the form of an endless belt element;

Fig. 13 is a side view of another form of slideway, having spring-loading at one end;

Fig. 14 is a block circuit diagram of an electronic automatic control system to which at least one nep sensor, a fibre length sensor and an

adjusting device, for example, a motor, for displacing the slideway are connected; and

Fig. 15 is a side view of the end region of a card top bar with head, the slideway on the flexible bend and a portion of the cylinder.

With reference to Fig. 1, a carding machine, for example of the type known as the EXACTACARD DK 803 (trade mark) manufactured by Trützschler GmbH & Co. KG, has a feed roller 1, a feed table 2, licker-ins 3a, 3b, 3c, a cylinder 4, a doffer 5, a stripping roller 6, squeezing rollers 7, 8, a web guide element 9, a web funnel 10, take-off rollers 11, 12, a revolving card top 13 with card top bars 14, can 15 and can coiler 16. The directions of rotation of the rollers are shown by curved arrows. M denotes the mid-point (axis) of the cylinder 4.

The arrangement shown in Fig. 2, which is not in accordance with the invention, serves to illustrate certain features that will be mentioned further below. With reference to Fig. 2, on each side of the carding machine a flexible bend 17 is secured by screws 18 (see Fig. 7a) laterally to the machine frame; the flexible bend has several adjusting screws 19 (see Fig. 7a, 10). The flexible bend 17 has a convex outer surface 17a and an underside 17b. Above the flexible bend 17 there is a slideway 20, for example, of non-stick plastics material, which has a convex outer surface 20a and a concave inner surface 20b. The concave inner surface 20b lies on the convex outer surface 17a and is able to slide on this in the direction of arrows A, B. The card top bars 14 have at each end a head 14a, to which two steel pins 14b

are secured axially; these pins slide on the convex outer surface 20a of the slideway 20 in the direction of arrow C. The card top clothing 14d is mounted on the under surface of the supporting member 14c. The reference number 21 denotes the circle defined by the tips of the card top clothings 14d. On its circumference the cylinder 4 has a cylinder clothing 4a, for example, a saw-tooth clothing. The reference number 22 defines the circle formed by the tips of the cylinder clothing 4a. The distance between the tip circle 21 and the tip circle 22 is denoted by the letter a and is, for example, 0.20 mm. The distance between the convex outer surface 20a and the tip circle 22 is denoted by b. The radius of the convex outer surface 20 is denoted by r_1 and the radius of the tip circle 22 is denoted by r_2. The radii r_1 and r_2 intersect at the mid-point M (see Fig. 1) of the cylinder 4.

In the embodiment of the invention shown in Fig. 3, a flexible bend 17 is associated with a sliding slideway 20. The distance c between the convex outer surface 20a and the concave inner surface 20b of the slideway decreases circumferentially - viewed in direction B - from c_1 to c_2 and the distance d between the convex outer surface 17a of the bend and the axis M of the cylinder 4 increases circumferentially - viewed in direction B - from d_1 to d_2, so that the sum of the two distances c_1, d_1 and c_2, d_2 is constant at all points over the circumference. A first wedge is formed by the slideway 20, a second wedge is formed by the flexible bend 17. The concave inner surface 20b and the convex outer surface 17a are in sliding contact with one another. The mid-point of

the convex outer surface 20a corresponds to the mid-point M of the cylinder 4. The mid-point of the circle defined by the concave inner surface 20b and the convex outer surface 17a does not coincide with the mid-point M of the cylinder 4.

In the embodiment of Fig. 4, between the concave inner surface 20b of the slideway 20 and the convex outer surface 17a of the flexible bend 17 there is an intermediate layer 23 which is slideable in the direction of the arrows D, E. The distance between the convex outer surface 20a and the concave inner surface 20b is constant. The distance e between the convex outer surface 23a of the intermediate layer 23 and the concave inner surface 23b of the intermediate layer 23 decreases circumferentially - viewed in the direction D - from e_1 to e_2 and the distance f between the convex bearing surface 17a and the axis M of the cylinder 4 increases correspondingly from f_1 to f_2, so that the sum of the distances e and f is constant over the circumference. The mid-point of the convex outer surface 20a and the concave inner surface 20b corresponds to the mid-point M of the cylinder 4. The mid-point of the circle defined by the concave inner surface 23b and the convex outer surface 17a does not coincide with the mid-point M of the cylinder 4. A first wedge is formed by the intermediate layer 23 and a second wedge wedge is formed by the flexible bend 17. The concave inner surface 20b and the convex outer surface 23a on the one hand, and the concave inner surface 23b and the convex outer surface 17a on the other hand, are in sliding contact with one another.

In the embodiment shown in Fig. 5, an intermediate layer 23 is present between the concave inner surface 20b and the convex outer surface 17a. The slideway 20 is arranged to slide in direction A, B and the intermediate layer 23 is arranged to slide in direction D, E. The distance g between the convex outer surface 20a and the concave inner surface 20b decreases circumferentially - viewed in direction A - from g_1 to g_2 and the distance h between the convex outer surface 23a and the axis M of the cylinder 4 increases correspondingly from h_1 to h_2 so that the sum of the two distances g and h is constant at all points over the circumference. The mid-point of the convex outer surface 20a and the mid-point of the convex outer surface 17a correspond to the mid-point M of the cylinder 4. The mid-point of the circle defined by the concave inner surface 20b and the mid-point of the convex outer surface 23a do not coincide with the mid-point M. A first wedge is formed by the slideway 20 and a second wedge is formed by the intermediate layer 23. The concave inner surface 20b and the convex outer surface 23a are in sliding contact with one another.

In the embodiment of Fig. 6, two intermediate layers 23 and 24 are present between the concave inner surface 20b of the slideway 20 and the convex outer surface 17a of the flexible bend 17. The distance between the convex outer surface 20a and the concave inner surface 20b is constant. The intermediate layer 23 is arranged to slide in the direction of arrows D, E and the intermediate layer 24 is arranged to slide in the direction of arrows F, G. The distance i between the convex outer surface 23a and the concave

inner surface 23b increases circumferentially - viewed in direction D - from i_1 to i_2 and the distance k between the concave outer surface 24a of the second intermediate layer 24 and the axis M of the cylinder 4 decreases correspondingly from k_1 to k_2 so that the sum of the two distances *i* and k is constant at all points over the circumference. The mid-point of the convex outer surface 20a, the concave inner surface 20b and the convex outer surface 17a corresponds to the mid-point M of the cylinder 4. The mid-point of the circle defined by the concave inner surface 23b and the convex outer surface 24a does not coincide with the mid-point M of the cylinder. A first wedge is formed by the first intermediate layer 23 and a second wedge is formed by the second intermediate layer 24. The concave inner surface 23b and the convex outer surface 24a are in sliding contact with one another.

Fig. 7a shows an arrangement in which the slideway is located in a channel 25 is provided in the circumferential direction of the flexible bend 17. The slideway 20, which consists of a flexible (resilient), non-stick plastics material, is mounted in the channel 25, part of the slideway being located in the channel 25 and the other part projecting beyond the convex outersurface 17a, as may be seen from Fig. 7b. The slideway 20 is arranged to slide inside the channel in the direction of arrows A, B, the concave inner surface 20b sliding along the base 25a of the channel. The side faces 25b and 25c form lateral guides for the slideway 20. The construction corresponds in function, for example, to that of Fig. 3.

In yet another embodiment, shown in Fig. 8a, a displaceable intermediate layer 23 is present inside the channel 25 between the concave inner surface 20b and the base 25a of the channel, (see Fig. 8b). The construction corresponds in function, for example, to that of Fig. 4.

Figs 9a and 9b illustrate the displacement of the slideway 20 on the flexible bend 17 in the direction of arrow A. By displacement, for example, by 50 mm, the distance b between the tip circles 21 and 22 is increased from b_1 (Fig. 9a), for example 0.30 mm, to b_2 (Fig. 9b), for example 0.5 mm. The card top bars 14 are moved slowly in direction C between the card top guide roller 13a and card top guide roller 13b by a drive belt (not illustrated), and subsequently guided round and then returned again on the opposite side. The radius of the convex outer surface 17a of the flexible bend 17 is denoted by r_3, and r_4 denotes the radius of the concave inner surface 20b of the slideway. The card top guide rollers 13a, 13b run in the direction of arrows H and I respectively.

In one form of device for effecting sliding of one of the first and second wedges, shown in Fig. 10, there is mounted on the slideway 20 a driver element 26 which is connected to a rack 27a in which a gearwheel 27b rotatable in direction O, P engages; the gearwheel is driven by a driving device 40, for example, a reversing motor, with the result that the slideway 20 can slide in the direction of arrows A, B.

In the embodiment of Fig. 11, the two ends of the slideway 20 are wound onto driven winding drums 28, 29 which rotate in the direction of the curved arrows

N_1, N_2 and K,L respectively. The reference numbers 42 and 43 denote reversing drive motors.

In a further embodiment, shown in Fig. 12, the slideway 20 is in the form of an endlessly circulating belt which runs round rollers 27, 30, 31, 32, 33. The drive device 27, for example, a motorised roller, is rotatable in the direction of the arrows O, P, the slideway 20 being slideable in direction A, B. The reference number 44 denotes a reversing motor.

In the embodiment of Fig. 13, the slideway 20 is secured at one end by way of a tension spring 34 to a locating point 35. Tension is exerted on the slideway 20 in direction R by the driven card top guide roller 13b. An intermediate layer 23, which is arranged to slide in the direction of the arrows D, E (cf. Fig. 5), is present between the slideway 20 and the flexible bend 17.

With reference to Fig. 14, a system for initiating a change in the gap between the tips of the card top clothing and the clothing of the cylinder may include an electronic automatic control system 36, for example, a microcomputer, to which a measuring element 37 for automatic detection of the nep count, for example, of the type known as the NEPCONTROL NCT (trade mark) manufactured by Trützschler GmbH & Co. KG, a measuring element 38 for measuring fibre length, and an actuator 39, for example, a drive motor 40, are connected. The measured values for the fibre length, which are determined, for example, by a fibrograph, can also be entered in the electronic automatic control system 36 by way of an input device. A switching element, for example, a push-button or similar means, by means of which the motor 40 is

operated, can also be connected to the electronic automatic control system 36. Furthermore, a measuring element 41, for example, of the type known as the FLATCONTROL FCT manufactured by Trützschler GmbH & Co. KG, for measuring the distance a between the tips 21 of the card top clothings 13d and the tips 22 of the cylinder clothing 4a can be connected to the electronic automatic control system 36.

With reference to Fig. 15, when the slideway 20 is displaced from the position shown in Fig. 9a in the direction of arrow A into the position shown in Fig. 9b, the convex outer surface 20a is displaced upwards in the direction of arrow U, with the result that at the same time the card top bar with the heads 14a, 14b (only 14b is shown) is displaced upwards in the direction of arrow T, so that the distance (b) between the head 14a, 14b of the card top and the tips of the cylinder clothing 4a is enlarged from b_1 to b_2. At the same time, the distance (a) between the tips of the card top clothing 14d and the tips of the cylinder clothing 4a is enlarged from a_1 to a_2. If, conversely, the card top bar 14 is displaced downwards in direction S, the distance a is reduced from a_2 to a_1.

Claims

1. An apparatus comprising clothed card top bars on a carding machine, in which a gap is present between the tips of the card top clothings and the tips of the cylinder clothing and in which the card top bars slide with each of their ends on a respective convexly curved slideway, each of which is formed by a flexible element that is arranged on a convex surface of a respective flexible bend, wherein the slideway is arranged to be displaced in a radial direction such that the distance between the tips of the card top clothings and the tips of the cylinder clothing remains uniform at all points over the circumference.

2. An apparatus according to claim 1, in which at least one said slideway has a convex outer surface and a concave inner surface and the distance between the said outer and inner surfaces of the slideway decreases or increases in the circumferential direction and the distance between the convex bearing surface of the flexible bend and the axis of the cylinder increases or decreases correspondingly, so that the sum of the two said distances is constant at all points over the circumference.

3. An apparatus according to claim 2, in which the slideway and/or the flexible bend are/is displaceable circumferentially, whereby the convex outer surface of the slideway is displaceable locally concentrically in a radial direction.

4. An apparatus according to any one of claims 1 to 3, in which the concave inner surface of the slideway lies on the envelope of the flexible bend.

5. An apparatus according to any one of claims 1 to 4, in which the flexible bend has a recess, for example, a

channel, for the slideway, wherein the concave inner surface of the slideway lies on the convex base of the channel.

6. An apparatus according to claim 1, in which, in the case of at least one slideway, between the slideway and the bearing surface of the flexible bend there is an intermediate member, and the distance between the convex outer surface of the slideway and a concave inner surface of the slideway decreases or increases in the circumferential direction, and the distance between the convex outer surface of the intermediate element and the axis of the cylinder increases or decreases correspondingly, so that the sum of the two said distances is substantially constant at all points over the circumference.

7. An apparatus according to claim 6, in which the slideway and/or the intermediate layer are/is circumferentially displaceable, whereby the convex outer surface of the slideway is locally displaceable concentrically in a radial direction.

8. An apparatus according to any one of claims 2 to 7, in which the slideway is in the form of a curved wedge.

9. An apparatus according to claim 8, in which the distance between the convex outer surface of the slideway and the concave inner surface of the slideway decreases and increases uniformly.

10. An apparatus according to claim 1, in which the at least one said slideway has a curved convex outer surface and a concave inner surface, the spacing between the said outer and inner surfaces of the slideway being constant, in which an intermediate member is present between the concave inner surface of the slideway and the bearing surface of the flexible bend and the distance between a convex outer surface of the intermediate layer and a concave inner surface of the intermediate layer decreases or increases in

the circumferential direction, and in which the distance between the convex bearing surface of the flexible bend and the axis of the cylinder increases or decreases correspondingly, so that the sum of the two said distances is substantially constant at all points over the circumference.

11. An apparatus according to claim 1, in which the at least one said slideway has a curved convex outer surface and a concave inner surface the spacing between the said outer and inner surfaces being constant, in which between the concave inner surface of the slideway and the bearing surface of the flexible bend there are two intermediate layers, and the distance between the convex outer surface and the concave inner surface of the first intermediate layer decreases or increases in the circumferential direction and the distance between the convex outer surface of the second intermediate layer and the axis of the cylinder increases or decreases correspondingly, so that the sum of the two distances is substantially constant at all points over the circumference.

12. An apparatus according to claim 10, in which the intermediate layer and/or the flexible bend are/is circumferentially displaceable, whereby the convex outer surface of the slideway is locally displaceable concentrically in a radial direction.

13. An apparatus according to claim 11, in which the two intermediate layers are circumferentially displaceable, whereby the convex outer surface of the slideway is locally displaceable concentrically in a radial direction.

14. An apparatus according to any one of claims 10 to 13, in which at least one intermediate layer is in the form of a curved wedge.

15. An apparatus according to any one of claims 10 to 13, in which at least one intermediate layer is formed by a flexible element.

16. An apparatus according to any one of claims 10 to 13, in which at least one intermediate layer is in the form of a metal band, for example, a steel band.

17. An apparatus according to any one of claims 10 to 16, in which the concave inner surface of the slideway lies on the convex outer surface of an intermediate layer.

18. An apparatus according to any one of claims 10 to 17, in which the flexible bend has a recess, for example, a channel and the concave inner surface of an intermediate layer lies on the convex base of the channel.

19. An apparatus according to any one of claim 10 to 18, in which at least one intermediate layer is arranged in a channel in the flexible bend.

20. An apparatus according to claim 19, in which at least one intermediate layer is displaceable in the channel circumferentially.

21. An apparatus according to any one of claim 10 to 20, in which the concave inner surface of a first intermediate layer lies on the convex outer surface of a second intermediate layer.

22. An apparatus according to any one of claims 10 to 21, in which the form of the or each intermediate layer is produced by machining, for example, grinding, or a similar process.

23. An apparatus according to any one of claims 1 to 22, in which during the displacement, for example, during sliding, two elements of wedge-like construction slide on one another.

24. An apparatus according to any one of claims 1 to 23, in which the convex outer surface of the slideway is

displaceable substantially concentrically with respect to the envelope of the cylinder.

25. An apparatus according to any one of claims 1 to 24, in which the convex outer surface of the slideway is circularly curved.

26. An apparatus according to any one of claims 1 to 25, in which at least a part of the slideway projects beyond the convex outer surface of the flexible bend.

27. An apparatus according to any one of claims 1 to 26, in which the slideway and/or, if present, the intermediate layer or intermediate layers are/is formed from a plastics material element.

28. An apparatus according to claim 27, in which the plastics material element has a low coefficient of friction.

29. An apparatus according to claim 26 or claim 27, in which the plastics material is reinforced, for example, by glass fibres, carbon fibres or similar such fibres.

30. An apparatus according to any one of claims 1 to 29, in which the slideway and/or, if present, the intermediate layer or layers consist/consists of a flexible metal band, for example, of steel.

31. An apparatus according to any one of claims 1 to 30, in which the flexible bend has a channel for the slideway and the slideway is guided in the channel laterally against the side faces of the channel.

32. An apparatus according to any one of claims 1 to 31, in which the flexible bend has a channel for the slideway and the slideway is vertically displaceable in the channel.

33. An apparatus according to claim 31 or claim 32, in which the slideway is circumferentially displaceable in the channel.

34. An apparatus according to any one of claims 1 to 33, in which the form of the concave inner surface of the slideway is produced by machining, for example, grinding or a similar process.

35. An apparatus according to any one of claims 1 to 34, in which the form of the convex bearing surface of the flexible bend and/or the base of the channel, if present, is produced by machining, for example, grinding or a similar process.

36. An apparatus according to any one of claims 1 to 35, in which a displacement device for the local displacement of the slideway and/or an intermediate layer and/or the flexible bend is provided.

37. An apparatus according to claim 36, in which a driving device, for example, a motor, is associated with a said displacement device.

38. An apparatus according to claim 37, in which a transmission element is provided between the slideway and/or an intermediate layer and the driving device.

39. An apparatus according to any one of claims 36 to 38, in which the displacement device has at least one actuator, for example, a lever, toothed rack, gearwheel, rotary joints or similar means.

40. An apparatus according to any one of claims 36 to 39, in which the displacement device engages substantially the middle of the slideway and/or an intermediate layer.

41. An apparatus according to any one of claims 36 to 40, in which the ends of the slideway and/or the intermediate layer are secured to driven rotatable winding drums or similar means.

42. An apparatus according to any one of claims 36 to 40, in which the slideway and/or the intermediate layer

are/is in the form of an endless belt, which runs around at least two guide rollers.

43. An apparatus according to claim 42, in which at least one guide roller is driven, for example, by a motor.

44. An apparatus according to any one of claims 36 to 43, in which at least part of the slideway and/or the intermediate layer have/has teeth which co-operate with at least one gearwheel.

45. An apparatus according to any one of claims 1 to 44, in which the slideway co-operates with at least one band-shaped element, which is substantially in the form of a curved wedge.

46. An apparatus according to any one of claims 1 to 45, in which a drive device, for example, motor, is connected to an electronic automatic control system, for example, a microcomputer, for displacement of the slideway and/or the intermediate layer and/or the flexible bend.

47. An apparatus according to claim 46, in which a measuring element for measuring the fibre length is connected to the automatic electronic control system.

48. An apparatus according to claim 46 or claim 47, in which a measuring element for detecting the nep count is connected to the automatic electronic control system.

49. An apparatus according to any one of claims 46 to 48, in which a measuring element for detecting the distance between the tips of the card top clothings and the tips of the cylinder clothing is connected to the automatic electronic control system.

50. An apparatus according to any one of claims 46 to 49, in which a switching element for operating the driving device, is connected to the electronic automatic control system.

51. An apparatus according to any one of claims 46 to 50, in which an input element for the measured values of the fibre length is connected to the electronic automatic control system.

52. An apparatus according to any one of claims 1 to 51, in which the slideway and a band-form element are displaceable circumferentially and in the radial direction.

53. An apparatus according to any one of claims 1 to 51, in which the slideway is displaceable in the radial direction and the band-form elements are displaceable circumferentially and in the radial direction .

54. An apparatus according to any one of claims 1 to 53, in which two wedge-like elements are present, at least one wedge-like element is displaceable circumferentially and at least one element consists of a flexible material, for example, plastics material or steel.

55. An apparatus on a carding machine comprising a plurality of card top bars and a support structure having a surface upon which ends of the card top bars can rest with their carding surfaces opposed to a part of the surface of the carding cylinder, wherein the support structure comprises first and second co-operating members, of which the first member is so configured that it tapers in a first direction circumferentially relative to the cylinder and the second member is so configured that it tapers in the opposite circumferential direction, the first and second members having co-operating curved surfaces along which relative slideable displacement of the first and second members relative to one another circumferentially with respect to the cylinder can be effected, the arrangement being such that relative slideable displacement between said first and second members effects radial displacement of the card top bar support surface.

56. An apparatus according to claim 55, in which the first member is a slideway for the card top bars and the second member is a flexible bend, the slideway co-operating with a bearing surface of the flexible bend.

57. An apparatus according to claim 55, in which the first member is a slideway for the card top bars and the second member is an intermediate member located between the slideway and a flexible bend.

58. An apparatus according to claim 55, in which the support structure comprises a slideway for the card top bars and a flexible bend, the first and second members being located between the slideway and the flexible bend.

59. An apparatus for effecting displacement of a slide surface for card top bars, the apparatus being substantially as described herein with reference to and as illustrated by any of Figures 3 to 15.

60. A method of adjusting the spacing between card top bars of a carding machine and the surface of a portion of a carding cylinder facing the card top bars, comprising slideably displacing relative to one another a pair of wedge members, said sliding displacement occurring along co-operating curved surfaces of the wedge members and in a direction which is substantially circumferential relative to the cylinder, whereby a support surface for the card top bars is caused to move radially inwards or outwards relative to the cylinder.

61. A method of adjusting the spacing between card top bars and a carding cylinder substantially as described herein.

The Patent Office

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Claims searched: 1-61

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Databases searched:

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UK Cl (Ed.P): D1N.

Int Cl (Ed.6): D01G.

Other: Online:WPI.

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0476407 A1 (RIETER) see angled surfaces at 34, Fig. 1.	1,55,60.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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